Electronic Supplementary Material (ESI) for Polymer Chemistry

Electronic Supplementary Information

Stainless steel surfaces with thiol-terminated hyperbranched polymers for functionalization *via* thiol-based chemistry

Wen Jing Yang
NUS Graduate School for Integrative Science and Engineering
National University of Singapore
Kent Ridge, Singapore 117576

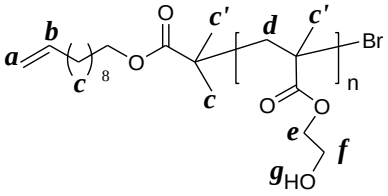
Koon-Gee Neoh and En-Tang Kang*
Department of Chemical & Biomolecular Engineering
National University of Singapore
Kent Ridge, Singapore, 119260

Serena Lay-Ming Teo*
Tropical Marine Science Institute
National University of Singapore
Kent Ridge, Singapore, 119223

Daniel Rittschof*
Duke University Marine Laboratory
Nicholas School of the Environment
135 Duke Marine Lab Road
Beaufort, North Carolina 28516-9721, USA

*To whom correspondence should be addressed
Email addresses: cheket@nus.edu.sg (ETK); tmsteolm@nus.edu.sg (SLMT); ritt@duke.edu (DR)

1. ^{1}H NMR spectrum of *alkene*-PHEMA



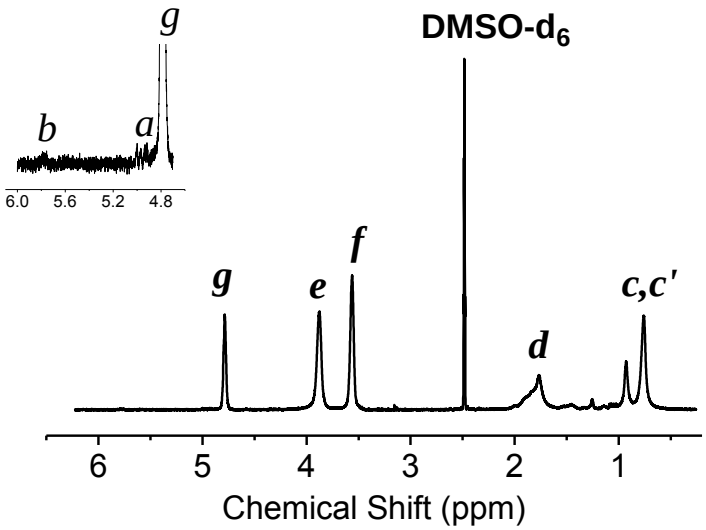


Figure S1 ^{1}H NMR spectra of *alkene*-PHEMA in DMSO.

2. Gel permeation chromatography (GPC) characterization of *alkene*-PHEMA

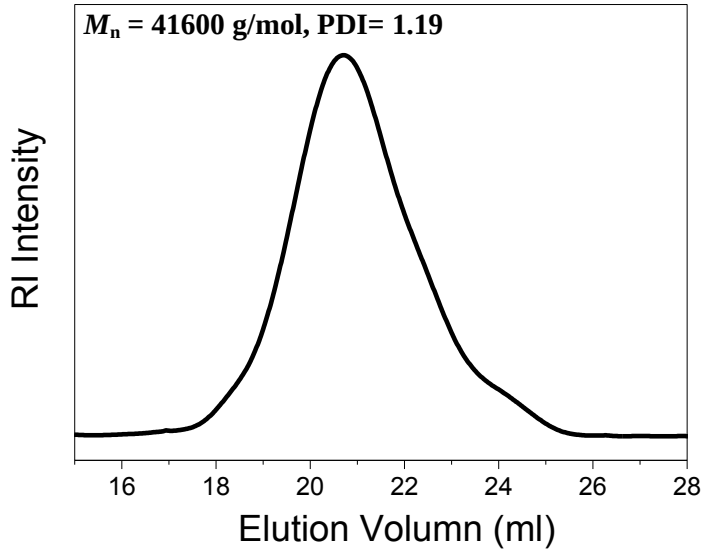


Figure S2 Gel permeation chromatography (GPC) elution trace of *alkene*-PHEMA in *N*,*N*-dimethylformamide (DMF) at an elution rate of 1.0 ml/min.

3. AFM topographies of the scratched GS-P(HEMA-*b*-SBMA), GS-PPEGMA and GS-PMETA surfaces for measurement of coating thickness

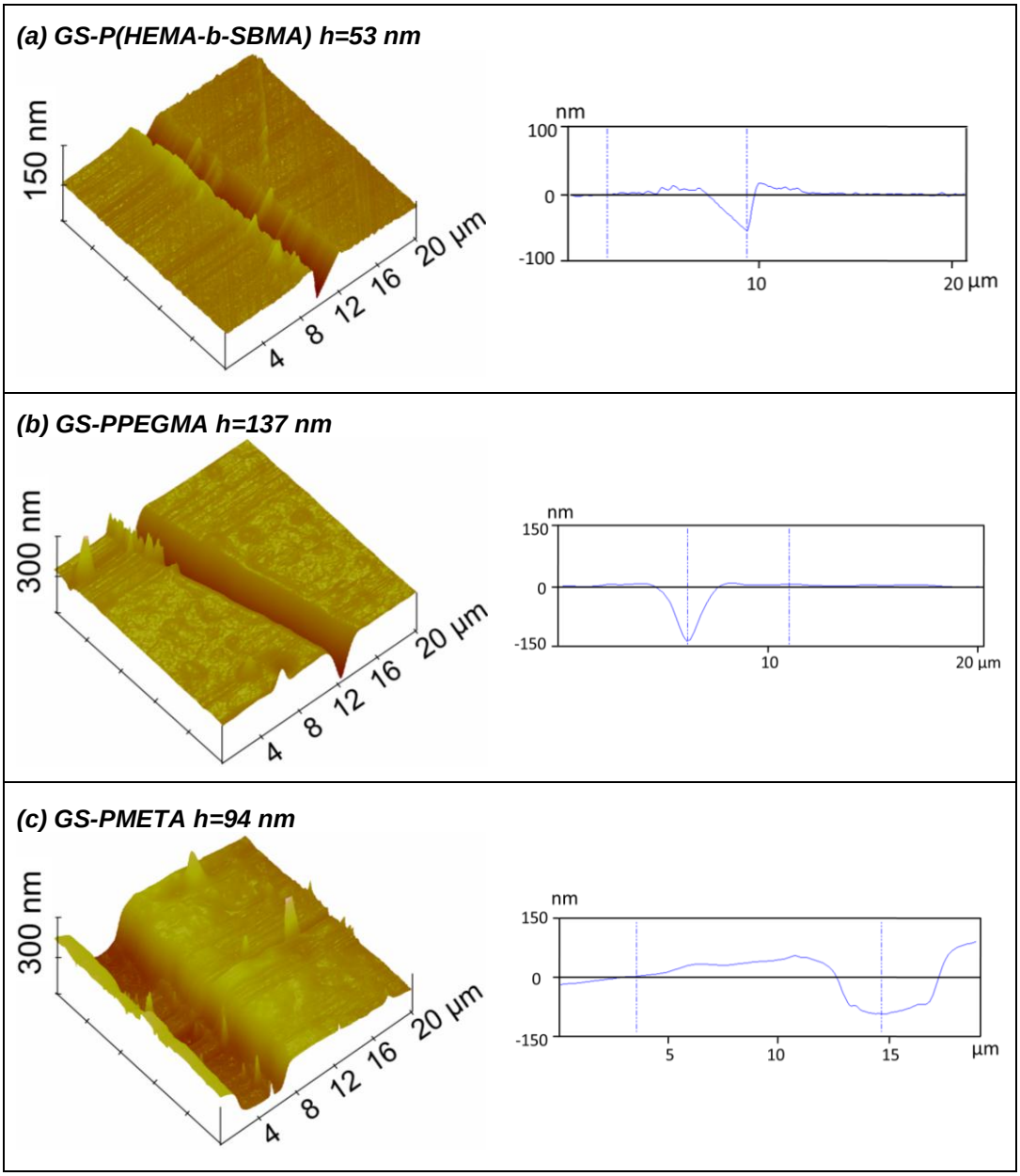


Figure S3 Atomic force microscopy (AFM) images of the scratched (a) GS-P(HEMA-*b*-SBMA), (b) GS-PPEGMA and (c) GS-PMETA surfaces. h=Thickness of polymer coating.

4. XPS characterization of SS-SH-linear, SS-P(HEMA-*b*-SBMA)-linear, SS-PPEGMA-linear and SS-PMETA-linear surfaces

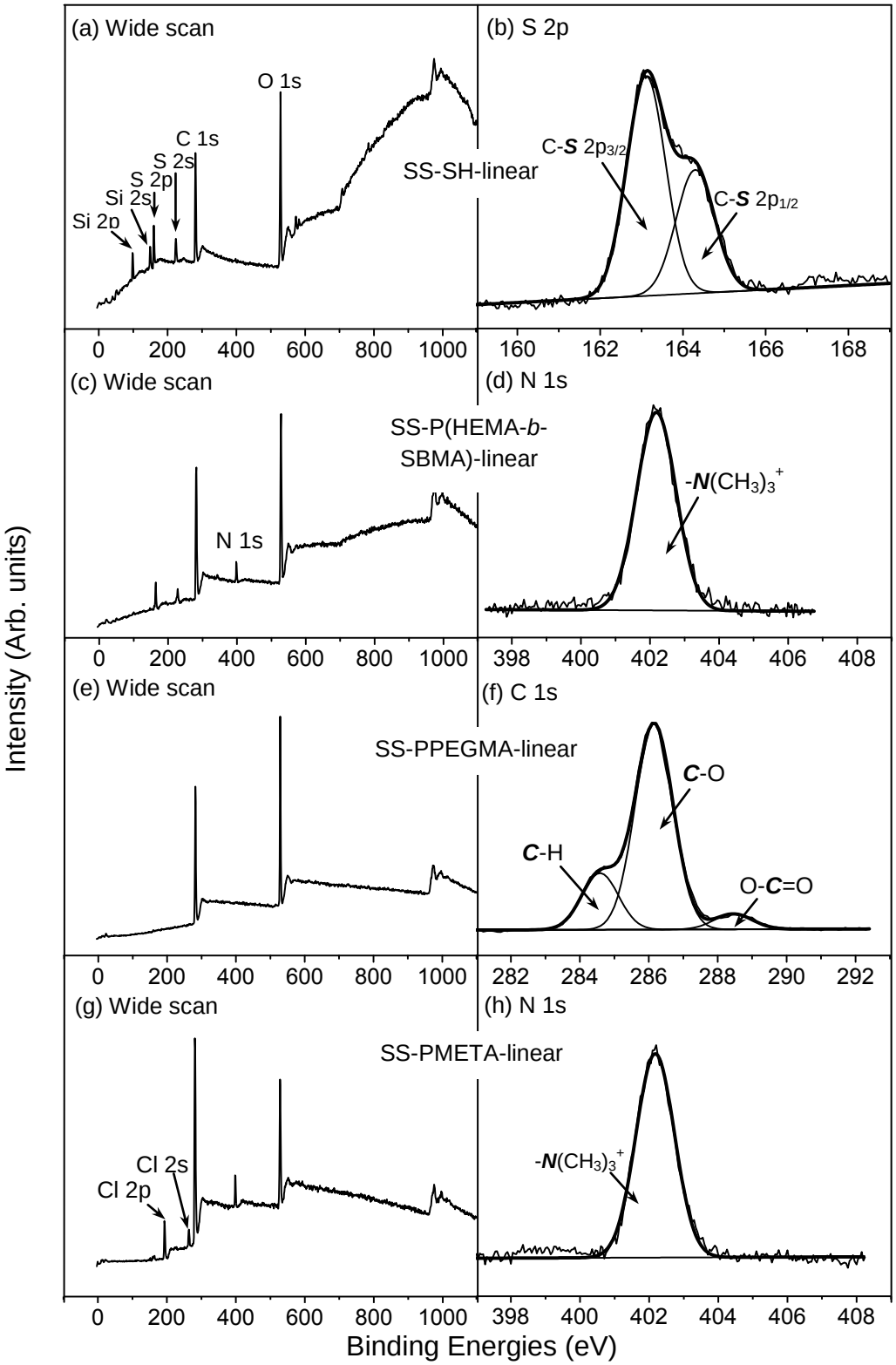


Figure S4 (a, b) XPS wide scan and S 2p core-level spectra of the SS-SH-linear surface; (c, d) XPS wide scan and N 1s core-level spectra of the SS-P(HEMA-*b*-SBMA)-linear surface; (e, f) XPS wide scan and C 1s core-level spectra of the SS-PPEGMA-linear surface; (g, h) XPS wide scan and N 1s core-level spectra of the SS-PMETA-linear surface

5. Stability of the polymer-functionalized SS surfaces

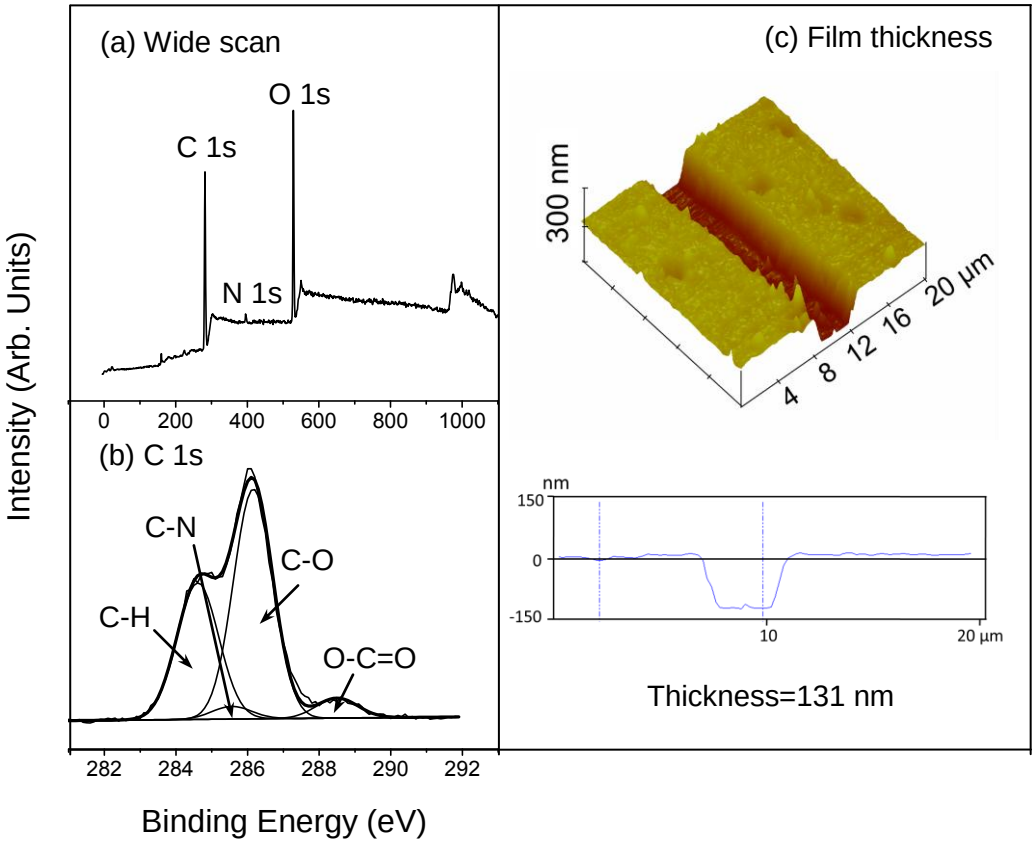


Figure S5 (a,b) XPS wide scan and C 1s core-level spectra of the SS-PPEGMA surface aged in PBS for 30 days; (c) Atomic force microscopy (AFM) images of the scratched GS-PPEGMA surface aged in PBS for one week.

6. Determination of thiol group concentration

The degree of mercaptoethylation was determined by direct titration of the thiol content with iodine and starch as colorimetric indicator.[1,2] The SS-SH substrate (~4 cm^2) was immersed in 10 ml of water. The pH of the solution was adjusted to pH 2 with 1 $mol \cdot l^{-1}$ HCl, and 0.5 ml of 1% aqueous solution of starch was added. The sample was titrated with aqueous iodine solution (0.6 $mmol \cdot l^{-1}$) until a permanent light-blue color was maintained. V= 70±10 µl. Thus, [SH] = $[I_2]$*V/4 $mol \cdot cm^{-2}$ = 10.5±1.5 $nmol \cdot cm^{-2}$

1. Kast, C. E.; Bernkop-Schnurch, A. *Biomaterials* **2001,** 22, 2345-2352.
2. Bertin, A.; Schlaad, H. *Chem. Mater.* **2009,** 21, 5698-5700.